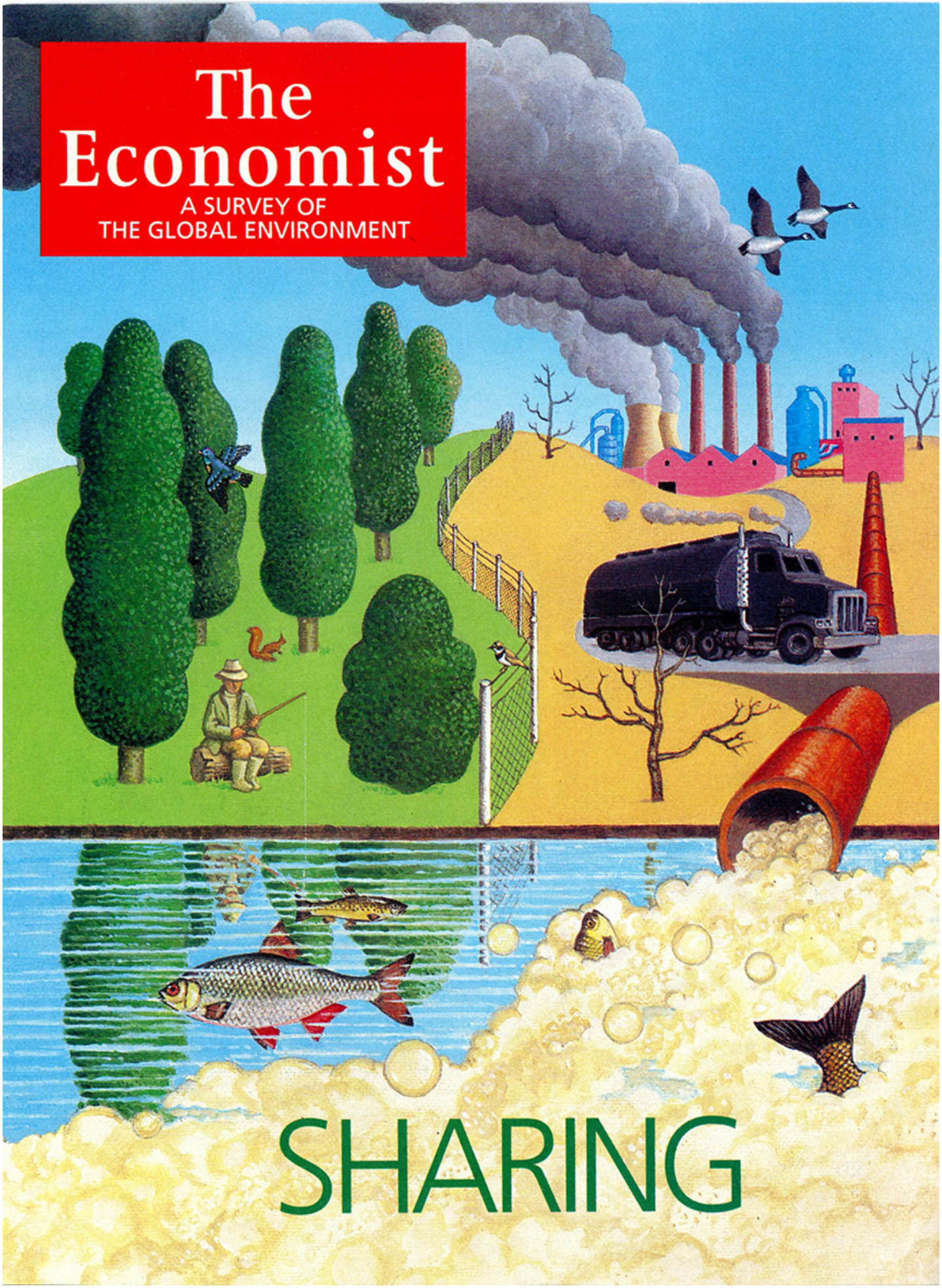
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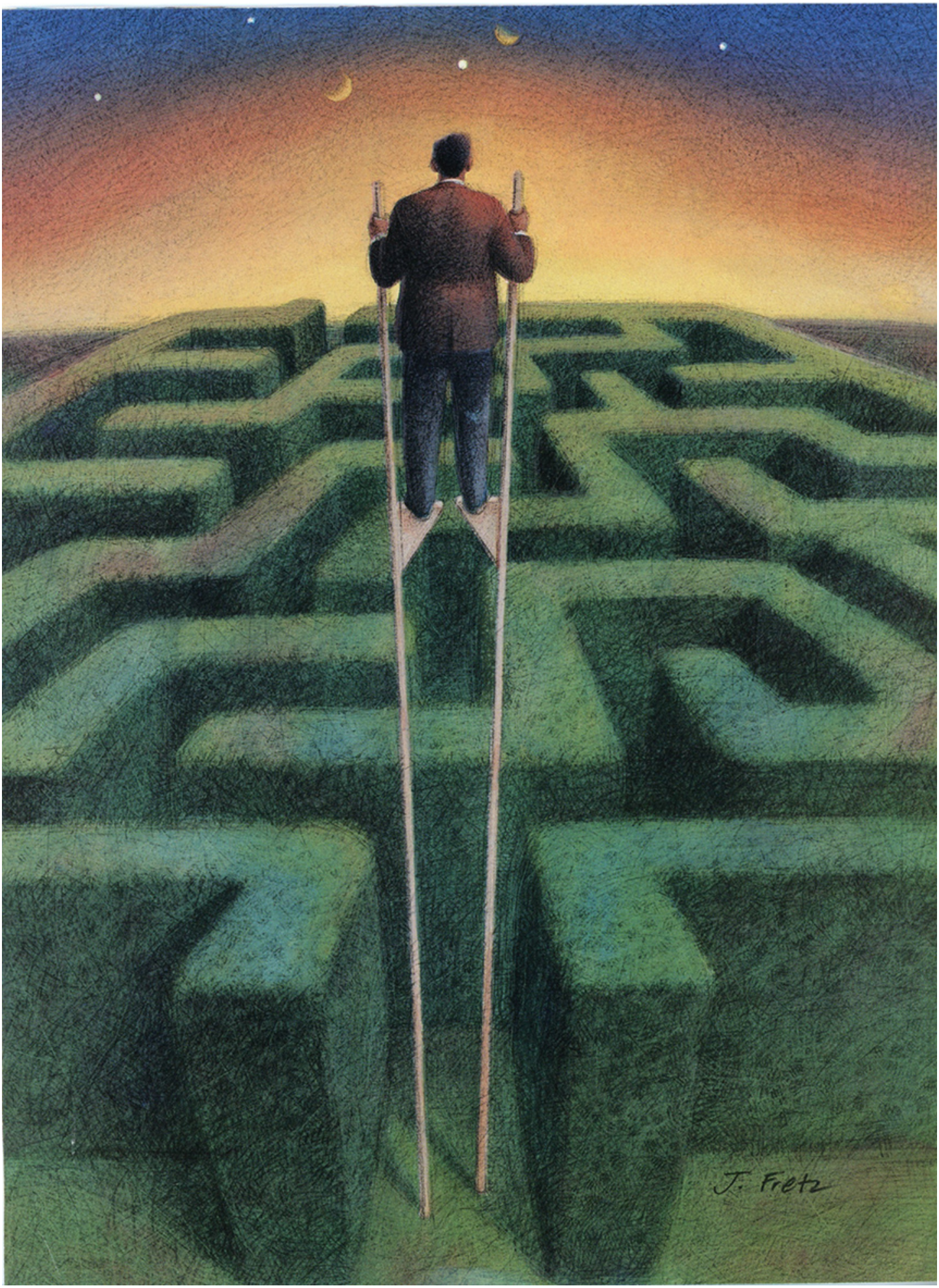
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THE ENVIRONMENT

Whose world is it, anyway?

Environmental issues increasingly affect countries' relations with each other. Rich countries must beware of imposing their own green standards on their poorer neighbours, writes Frances Cairncross

NATURE is no respecter of national boundaries. Across those dotted lines on the globe, winds blow, rivers flow and migrating species walk or fly. The dotted lines may carve up the earth, but the sea and the atmosphere remain open to all, to cherish or plunder. When people in one country harm that bit of the environment they assume to be theirs, many others may suffer, too. But how, and how much, can countries make their neighbours change their ways? That is the theme of this survey.

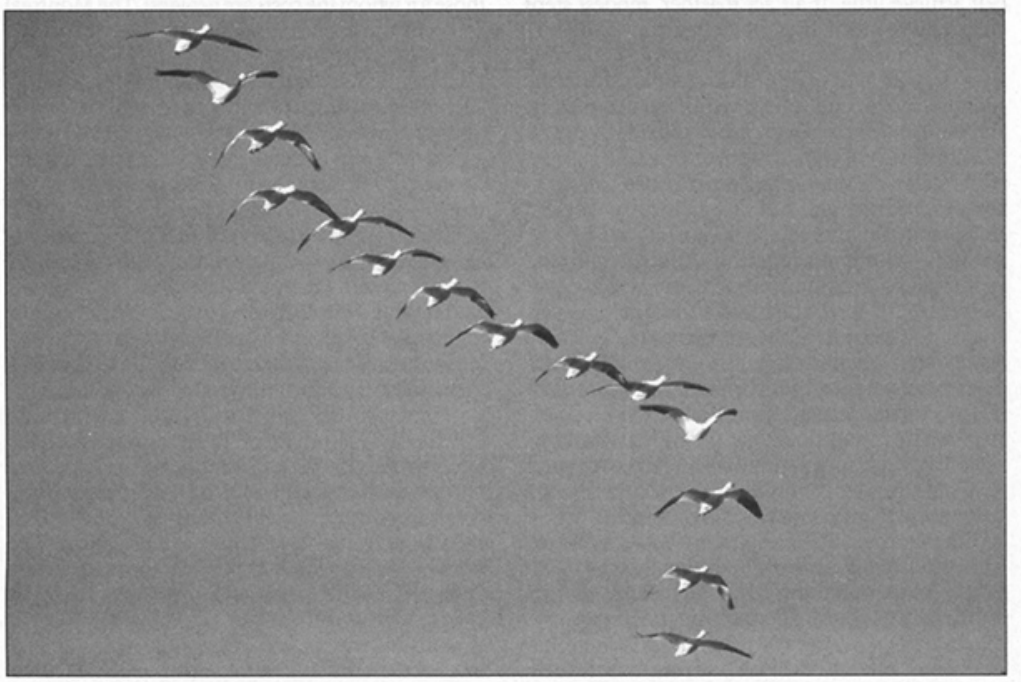
Such problems pose new issues for diplomats and economists. Reaching agreement often means resolving conflicting goals and priorities. Even among countries of similar wealth, environmental goals may differ: think of the rows with Iceland and Japan over whaling, or the reluctance of Britain to curb sulphur dioxide from power stations. But cross-border arguments are harder to resolve when many countries are involved, and especially when those countries have widely differing living standards and environmental priorities. Particularly intractable are the two main subjects on the agenda at next month's meeting of the United Nations Commission on Environment and Development (UNCED) in Rio de Janeiro: biological diversity and climate change.

That countries have different environmental goals is not surprising: a policy that brings large benefits to one country at little cost may have the opposite effect on another. But from such differences, many problems arise. Trade is inextricably affected. Tough green standards for products may keep out goods from countries that cannot meet them; tough rules to reduce the environmental impacts of production processes will make some companies less competitive than their rivals in laxer nations. Where such differences influence only the local environment, complaints may be muted. But where they cross borders, or affect the common heritage, environmentalists may demand that all countries meet common goals.

That embroils trade in other ways. Trade may be the mechanism by which environmental damage is perceived to cross borders, as in the case of toxic waste or the export of endangered species. It is also one of the few weapons governments can use to bully others into changing their behaviour. When one country feels that the environmental actions of another are harming its own people, it may see trade as a reasonable way to retaliate. Trade sanctions may also be used to provided some added glue for the fragile structure of international environmental agreements.

One earth

International agreement is the best way to solve environmental problems that transcend national borders. These are of three main kinds. First, neighbouring countries may share part of the environment: a river such as the Rhine or the Jordan, a stretch of water such as the Mediterranean or the Great Lakes. Regional problems—acid rain is one example—fall into this category. Second, some environmental resources, such as the atmosphere,



Across borders

the oceans and Antarctica, are shared by the whole planet. The build-up of climate-changing greenhouse gases, the thinning of the ozone layer and the killing of whales fall into this group. Lastly, some environmental assets clearly belong to individual countries, but their future may affect others, in either material or (more often) spiritual and emotional ways. The disappearance of coral reefs or elephants may not show up as more than a microscopic blip on gross world product, but it gives people in many countries a sense of loss.

To tackle problems like these, countries increasingly sign treaties. Two multilateral environmental treaties came into force in the United States between 1940 and 1959; ten between 1960 and 1979; 11 in the 1980s alone. Like all international treaties, those on the environment can be enforced only by the governments that abide by them.

The market is unlikely to help. Even in an individual country it will rarely deliver what is best for the environment. The costs to individuals and companies of polluting or pillaging the environment will be lower than the costs their activities impose on the rest of society. National environmental policies therefore need government to step in and ensure that polluters carry the costs they would otherwise dump on their fellow citizens.

Without a world government, no institution can compel international polluters to pay. True, there has been a rapid growth of institutions that aim to set international environmental priorities or persuade governments to reach (and abide by) agreements on environmental goals. But such institutions are no stronger than the governments that set them up. Agreement can therefore be based only on the belief that acting together brings more benefits than acting alone.

That belief will frequently be true. If one of the countries living round a polluted lake tries to clean the water by acting alone, it may make heroic efforts but achieve little. If all act together, modest steps may achieve much. If, say, Norway stopped all output of carbon dioxide next week, it would take only 46m tonnes out of the atmosphere. The same amount could equally be saved if every country in the world cut its output of carbon dioxide by 0.22%.

Conversely, if all but one of those lakeside countries reduces the muck it discharges into the water, that one country will still enjoy the improvement in water quality that the actions of its neighbours deliver. An individual country can generally do best of all by dropping out of a pact, as long as it cannot be excluded from the resulting gains. It can thus enjoy the rewards of travelling on the global bus without paying its fare, as a "free rider". This is the central paradox of international environmental agreements. All countries do better by co-operating than by acting alone; but individual countries often have a powerful incentive not to co-operate.

Countries are more likely to succumb to the temptation to hitch a free ride the more the costs of belonging to an international agreement diverge from the benefits it brings; or the longer the gap between the pain and the gain. The balance of costs and benefits will usually vary from one country to another. It will be partly a function of the number of countries involved. If only three countries live around that dirty lake, the gains that each enjoys from ending pollution will be much larger than if only two clean up. A completely clean lake is much nicer than a two-thirds clean lake. But if a dozen countries are involved, the difference made by the participation of one extra country will be small. The costs of participation to each country are the same, but the gains from co-operating are lower.

How can recalcitrant countries be brought on board? Either the costs of participation can be reduced, or its benefits can be increased. One option is to set targets that reflect the differing costs to individual countries of meeting them. International agreements frequently set uniform goals for each country: output of this gas or catches of that fish must be restricted to such-and-such a level over a set period of years. A well-designed agreement will try to ensure that the largest changes are made by those countries that find them least expensive.

Targets, however distributed, are more likely to be honoured if countries can agree on some way to verify them. That may not be easy. The Verification Technology Information Centre, a London-based body that usually thinks about arms agreements, has argued that it would be harder to reach a climate agreement that does not provide for verification than one that does. In fact, provisions for verification in the initial climate treaty that will be signed next month are even vaguer than the commitments signatories undertake. Verification is essential to build confidence, foster mutual trust, and encourage uncommitted nations to join. Industrial countries are slowly becoming more willing to go a step further and accept international inspection of their performance. The OECD has recently begun an inspection of Germany's environmental policies, as the first step in a programme that will eventually cover all its members.

Another way to reduce the costs of participation is for some governments to bribe others. The countries that gain most from an agreement may reward those for whom the costs are heaviest. The Montreal protocol on ozone-depleting substances (mainly chlorofluorocarbons or CFCs) includes a fund for such payments. Under the new climate treaty, the Global Environment Facility (GEF) will pay developing countries for the extra costs of policies to slow global warming. Such payments are easily (and wrongly) confused with international aid; they are really imports of environmental services. They raise large practical problems. How, for instance, can the world be sure that it is not paying a country to do something it would have done in any case? And how can a country be rewarded for introducing market-based incentives (higher energy prices, for instance), rather than making a one-off investment (in energy-efficient light bulbs, say)?

The problem of punishment

The alternative to bribery is bullying. This may simply take the form of international disapproval. Nobody likes being a pariah. Britain eventually agreed to stop dumping sewage sludge in the North Sea mainly because of the political costs of being dubbed "the dirty man of Europe". America has been under similar pressure to stabilise its output of global-warming gases. A peculiarity of international environmental agreements is the involvement of non-governmental organisations. It is hard

to imagine anti-nuclear campaigners playing a constructive role in disarmament talks, but green lobbyists are active participants in many environmental negotiations. As they are deft at mobilising popular protest, they also play a big part in encouraging governments to keep their promises.

But beyond protest, the options for punishment are few. A handful of examples exist of countries taking on binding commitments. That is likely only if governments are locked together by forces other than the environmental issue at stake. Within the EC, for example, the European Court can oblige a country to implement an environmental directive. Moreover, the Maastricht treaty on European union greatly extends the areas on which environmental policy decisions need only qualified-majority voting rather than unanimity.

Ultimately, trade sanctions are the most tempting weapon. A growing number of agreements include provision for trade sanctions to punish free-riders. The danger is that the costs of such penalties may exceed their benefits: the costs of lost trade may be greater than the environmental gains from wider compliance.

Where polluters are poor and those on the receiving end wealthy, the threat of such sanctions also has unpleasant overtones. The poor—whether they be South American countries destroying their rain forests or East Europeans burning soft coal in their power stations—may feel that their environmental priorities are being dictated by other countries. They may wish to concentrate on environmental risks to the lives and prosperity of their own citizens. They may feel, with some reason, that the rich countries are using their political and commercial muscle to impose their own green agenda.

This survey argues that the rich countries need to be sensitive to charges of "eco-colonialism" if they want to make the world a greener place. They need to be careful about using trade as a weapon to get their way and need to explore new kinds of financial transfers and aid. Developing countries that pursue environmental goals which go beyond their national interests can reasonably expect the developed countries to find ways to compensate them for doing so. Only by finding new kinds of bargains and new institutions to strike them can the interest of each country in its neighbour's environment be expressed in ways that do not threaten trade or national sovereignty.

Blowing the wrong way

The freedom to be dirtier than the rest

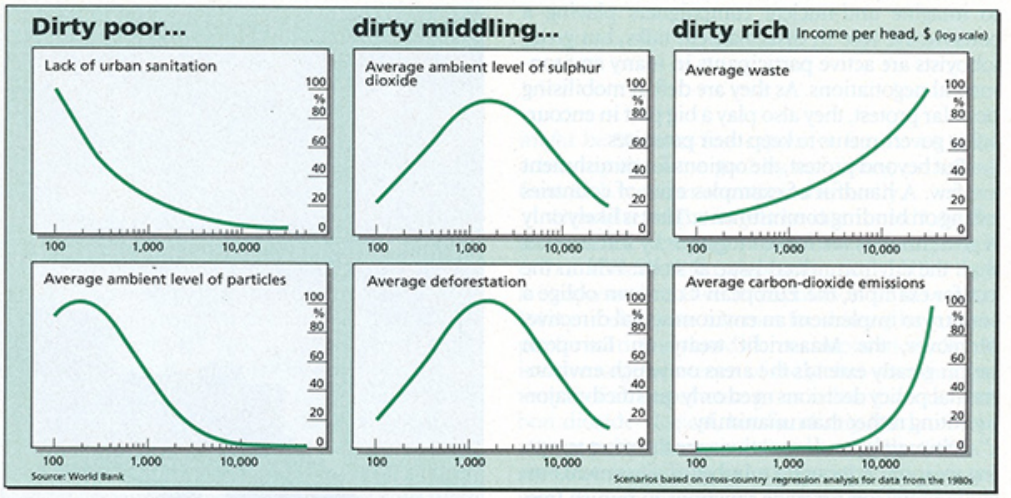
Why differing environmental priorities cause problems for trade

"JUST between you and me," mused Lawrence Summers, chief economist of the World Bank, in a memo leaked to *The Economist* in February, "shouldn't the World Bank be encouraging *more* migration of the dirty industries to the LDCs?"

Mr Summers gave three reasons for his controversial proposition. First, the costs of pollution depend on earnings lost through death and injury. These earnings are lowest in the poorest countries. Therefore, "I think the logic behind dumping a load of toxic waste in the lowest-wage country is impeccable and we should face up to that." Second, the costs of pollution rise disproportionately as it grows, so polluting the cleanest parts of the world may be less harmful than making the dirty parts still filthier. Third, people value a clean environment more as their incomes rise. So if polluting industries move from rich countries to poor ones, the costs of pollution will decline.

The tone is grating. The idea that life is worth less in poor countries than rich is a curious one for a World Bank official to promote. But the issues raised in the memo are central: how far ought countries to pursue different environmental standards? The answer has a direct impact on industry and on international trade. For differing green standards may be a powerful tool of protectionism, or may give some countries a cost advantage over competitors subject to tougher regulation. The effect is occasionally to create an alliance between environmentalists and industry, both arguing that other countries should abide by the same environmental standards as their own.

That national environmental priorities differ is inevitable. As the chart on the next page shows, some kinds of pollution rise steeply in the first stages of development, then die away as countries grow richer. In poor countries filthy water, untreated sewage, soot and dust from coal-burning, lead in city air and soil erosion still damage the health and wealth of millions of people. Tackling these problems must be the main environmental goals. But they may not be the goals that the rich



countries most want the poor to pursue.

The rich countries also tend to give priority at home to those environmental problems that harm health and wealth. But the pollution that is now growing as a result of affluence—smog-causing chemicals from cars, municipal waste and global-warming carbon dioxide from burning fossil fuels such as coal, oil and gas—is much less life-threatening. Having brought their most acute environmental problems under control, the industrial countries have increasingly turned their attention to those that cross international boundaries.

Different priorities make sense for other reasons. A country may deliberately decide to pay less attention to protecting its own environment than to other investments. When faced with a choice between cleaner air and less poverty, many poor countries will rightly accept more pollution than a rich country would, in exchange for more economic growth. If a developing country has the choice between (a) investing in scrubbers on power stations to prevent acid rain and (b) building hospitals, it will build hospitals first. And it will make more sense to persuade local industry to dump its toxic waste with reasonable safety than to persuade it to treat the stuff to American levels.

Even when countries are at the same stage of development, environmental standards should not necessarily be identical. There are relevant differences in the way the receiving environment reacts to pollution. An oil spill in the stormy North Sea does less lasting damage than a spill off the almost tideless Mediterranean coast; contaminated land matters less when it is far from homes and reservoirs.

A greener playing field

Are differing national environmental standards in the interests of companies? Michael Porter, Harvard Business School's guru of international competitiveness, argues that well-designed regulations can foster technological advance and restrain the cost of meeting green goals. In his view, a country may gain competitive advantage by raising, not lowering, its environmental standards, because others will eventually follow. He argues that environmental regulations, judiciously applied in Japan and Germany, have allowed those countries to dominate world markets for pollution-control equipment.

But the use of environmental regulation to force the pace of technological change is easily blurred with restraints on trade. Indeed, some protectionism may be inescapable in environmental policy. After all, the purpose of national regulations or economic instruments is to exclude products and producers that do not meet certain minimum standards. The effect is generally to restrict the national market to companies that can meet those standards, increasing their profits in ways that help to offset the extra costs that environmental measures entail. That effect, which provides companies with an incentive to meet tougher environmental goals, will be diluted if importers are exempted.

Environmental standards for products have the same effects as other product standards: they make trade a bit more complicated and arduous. For example, last year Germany passed legislation requiring companies to take back and recycle most of their packaging. Officials argued that there was nothing discriminatory about this: the obligation applied equally to German and to foreign firms (or rather, to their German distributors). But the impact is certainly likely to disrupt trade. Now the German government is considering legislation to require the car industry to take back and recycle its products at the ends of their lives. German car companies have for some years been devising recycling techniques. An obligation to retrieve and recycle cars would be easier for German manufacturers to meet than for foreign competitors.

Germany's take-back legislation is part of a trend in a number of European countries to reduce solid waste by making companies take responsibility for the final fate of their products. This will disrupt trade, if only because foreign companies are worse placed to retrieve their wares. Plenty of other environmental product standards also make trade more difficult, such as different national schemes of eco-labelling, or mandatory deposit schemes on products such as drinks bottles, or bans on certain materials such as plastics.

Differences in standards cause special headaches for the European Community (EC). They conflict with the principles of the internal market, in which each country's standards are accepted by

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others. But a landmark decision by the European Court in 1988 opened a loophole through which most of these measures have elbowed their way. The Court decided, against the wishes of the Commission in Brussels, to allow Denmark to insist on returnable drinks bottles. The implication was that, in certain circumstances, national environmental policy should take precedence over the mutual recognition of standards.

Higher product standards are allowed; lower process standards are frowned on. Much EC environmental legislation has been driven by a desire to stop some countries gaining competitive advantage by being dirtier than others. For example, in 1988 the EC agreed to the Large Combustion Plant directive, so that power stations had to take expensive steps to reduce their output of the gases that contribute to acid rain. Europe had already reached a (more modest) agreement to tackle cross-border air pollution, in the more logical forum of the Economic Commission for Europe, which brought together the eastern and western ends of the continent. Acid rain does not stop at the EC's boundaries, so why did the EC reach such an agreement? Mainly because Germany, driven by its noisy Green parties and by ghoulish descriptions of dying trees, had passed a law in 1983 requiring its coal-fired power stations to fit expensive flue-gas desulphurisation equipment or shut down. German companies grumbled that the law would raise electricity prices; the German government responded by brow-beating its EC partners into adopting much the same provisions.

Many environmentalists wish the GATT was a similar one-way street. But the GATT, unlike the EC, is concerned not with harmonising standards but with freeing trade. One of its basic principles is non-discrimination. That means that a country can impose whatever environmental rules or taxes it likes on imports or exports, as long as it does the same to its own products. But it cannot, except in extremely limited circumstances, impose rules on the processes used by foreign producers.

That constraint brings grumbles from both industry and environmentalists. As environmental controls on production processes grow tighter, producers will threaten to move to other countries where the controls are lighter. The costs of such controls inevitably affect price competitiveness, although usually by tiny amounts. In some industries, though, environmental regulations may impose large burdens. In these, industries may actually move rather than face a handicap in the export market.

Sometimes, companies decide to turn their backs on the cost advantages they might enjoy by producing in dirty countries. In the aftermath of the Bhopal disaster at a subsidiary of Union Carbide in India, a growing number of American chemical plants have made it company policy to apply the same rules worldwide. A recent study* found several examples of companies going out of their way to pursue higher standards than required in poor countries. For instance, IBM's subsidiary in Argentina has been unable to find a local disposal site for hazardous waste that meets company standards; so it recycles three-quarters of the waste it generates. Chevron uses only water-based lubricating fluids in its drilling operations in Nigeria, rather than oil-based ones used in the United States, because Nigeria has no facilities for hazardous-waste disposal. Admirable though such policies are, they defeat their objects if the result is that some overseas investment does not take place and is supplanted by local investment that meets lower standards.

More often, differences in environmental production standards will make industry moan about lost competitiveness. In the United States, where the costs of environmental policies are expected to rise sharply in the 1990s, this will lead to pressures of two kinds. First, legislators will toy with plans to impose special duties on imports produced under standards that are less strict than those in the United States. One such proposal was introduced into the Senate last year. Even if it had passed, it would not have helped companies which grumble that tough environmental standards handicap them in third markets. So a second approach has been to water down some green obligations. The Council on Competitiveness, chaired by Dan Quayle, has helped to block a number of proposals, including a scheme to require recycling of municipal waste.

Negotiations on a North American Free Trade Area between the United States and Mexico have shown how easily greens can end up on the same side as protectionists. Environmentalists, worried that freeing trade would lead to a weakening of standards, teamed up with companies and trade unionists worried that jobs would walk south to benefit from lower environmental costs. The result was a set of unprecedented concessions to green lobbyists. Last year American trade representatives promised to put environmentalists on their advisory committee and to conduct a review of the environmental impacts of the trade agreement. A senior

Plenty of scope for recycling

* "Managing the Global Environmental Challenge". By Business International, with Arthur D Little

official from the Environmental Protection Agency sits in whenever green issues are being negotiated, and the government has said that no American standards will be dropped to let in Mexican products.

As poor countries grow richer—and trade is a powerful source of wealth—their own environmental standards will rise. Most of their citizens will not welcome the idea that their competitive advantage should come from harming their own environment. But there will still be occasions when differing environmental priorities induce countries to threaten each other with trade sanctions—and to that we now turn.

GATTery v Greenery

The perils of eco-sanctions

DIFFERENCES in national environmental standards make industrialists grumble. But they also annoy environmentalists. Increasingly, trade measures are being used by countries or groups of countries to try to influence what happens beyond their own jurisdictions. This poses problems for GATT.

Many of these problems emerge from the most purely "environmental" dispute to come before a GATT arbitration panel: a row between the United States and Mexico over catches of dolphins by tuna-fishers. Its outcome makes clear the tight limits under the GATT to putting the environment before the basic rules of non-discrimination in trade. It is this case that has made GATT a four-letter word to fundamentalist greens. It will not be the last such dispute. Increasingly, environmentalists, especially in the United States, want to use trade sanctions to apply a little unilateral arm-twisting.

Yellow-fin tuna, which swim in the eastern tropical Pacific, congregate under shoals of dolphins. Tuna fishermen therefore round up the dolphins and trap them, along with the tuna, in purse-shaped nets. Americans not only have the world's largest market for tuna; they also have tender hearts, and are devoted to a tame dolphin called Flipper. The Marine Mammals Protection Act (MMPA) insists that imports of tuna from countries fishing in the eastern tropical Pacific will not be allowed unless that country has a programme to stop dolphin slaughter at least as tough as America's; and unless the average number of dolphins they kill is no more than 1¼ times that of American tuna-fishing vessels.

Easily the largest tuna-fishing fleet in the eastern tropical Pacific is that of Mexico. The American administration, well aware that the provisions of the MMPA conflicted with GATT's rules, has been unsurprisingly reluctant to implement them against Mexico. So the Earth Island Institute, a Californian lobbying group, took the government to court. In February last year the administration was compelled to impose an embargo on tuna imports from Mexico, Venezuela and Vanuatu. Mexico complained to GATT, with predictable results.

Worse is to come. The MMPA also lays down that other nations which have imported tuna from the offending country must be subject to the embargo as well. The aim is to prevent "tuna laundering". In October 1990 the Earth Island Institute found that a large American cannery in Thailand, which claimed to be selling "dolphin-friendly" tuna, was in fact importing fish that had been caught in decidedly unfriendly ways. In February this year the institute secured a further judgment requiring the administration to ban tuna imports from Thailand, Japan and the EC. Nobody has yet appealed to GATT.

In its ruling on the tuna-dolphin case, a GATT disputes panel argued that the GATT's non-discrimination principle meant that the treatment of imports and domestic products should be compared, not production regulations that had no effect on the product as such. In theory, one of two possible exceptions might apply. Both fall under Article XX of the GATT, which allows a number of exemptions to the principles of the organisation, on condition that they do not entail arbitrary discrimination or disguised trade restrictions. One of these allows measures to protect animal health or exhaustible natural resources (the word "environment" does not appear in the GATT's articles). But this exemption applies, said the panel, only when such resources lie within a country's own jurisdiction. The dolphins of the eastern tropical Pacific were clearly beyond America's reach.

Nor did a second possible exception apply. To do so, the tuna embargo would have to be shown to be aimed primarily at conservation, and to be the only course open to the United States. Neither point held: for one thing, Mexican fishermen could not know the limits to a year's dolphin catch in advance, because it depended on calculating retrospectively 125% of America's own catch that year; for another, the United States had failed to try to negotiate a treaty on preserving dolphins. The restriction therefore smacked more of trade protection than dolphin conservation.

The panel did allow another American law which requires that, if tuna products are labelled "dolphin friendly", they must meet certain dolphin-protection standards. The panel ruled that such labelling met GATT rules, because it was designed to prevent fraudulent advertising, whether of imported or domestically produced goods.

American law is likely to confront the GATT with an increasing number of cases like the tuna-dolphin one, to the embarrassment of the administration. The Earth Island Institute is already back in court, demanding an embargo on imports from French Guyana of shrimps caught in ways that also trap rare turtles. A yet more extreme use of trade sanctions is undoubtedly beyond GATT's rules. Angered by Japan's refusal to stop importing the shells of hawksbill sea turtles, which are on an internationally agreed list of endangered species that cannot be traded, the United States threatened to ban imports from Japan of pearls and all animal products, including more than $300m of fish. Japan agreed to ban imports of turtle shells by the end of

this year.

That story might be repeated if whaling is resumed. The International Whaling Convention meets in Glasgow in June to discuss that possibility, but Iceland has already resigned, declaring its intention to resume whaling. Refusing to import whale meat is obviously not an option open to the United States, because it does not buy the stuff anyway. But under American law the government is obliged to prohibit imports of all fish products from any state whose activities diminish the effectiveness of the IWC's conservation measures. That provision has already been used against Japan in retaliation for its objection to the IWC decision to halt commercial whaling in 1986.

All together

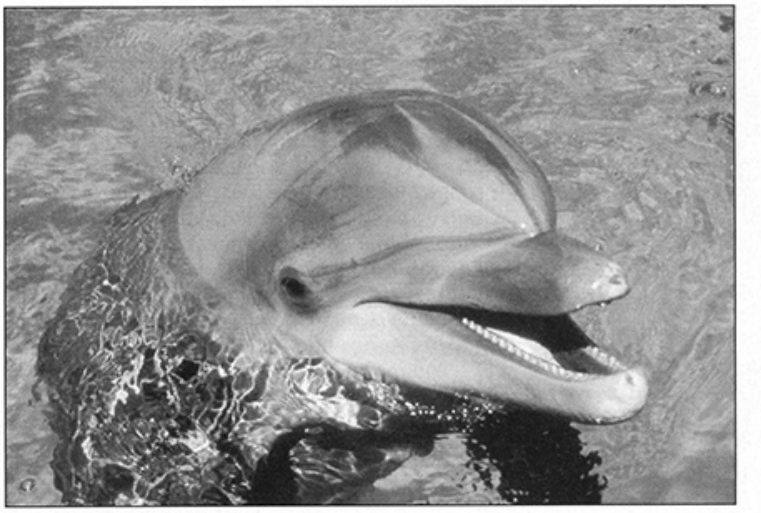
Trade sanctions by individual countries will generally break the GATT's rules. But several multilateral environmental agreements—17 of 127 examined by GATT—contain trade provisions. Only in two—the Basle convention on trade in hazardous waste and the Convention on Trade in Endangered Species (CITES) which bans trade in African elephants and a large number of other animals and species—are controls on trade central to the treaty. The Montreal protocol also raises awkward issues for GATT.

Trade controls are crucial to the Basle convention: after all, while airborne pollution blows across borders and contaminated water flows, solid waste can cross from one country to another only if somebody ships it. Under the convention, which acquired enough signatures to come into force at the beginning of May, movements of hazardous waste between parties and non-parties must stop, unless countries have a bilateral agreement that meets the terms of Basle.

The main practical problem has been to define the wastes Basle covers. This is difficult with wastes sent abroad for final disposal; it is even harder with the much larger amounts of waste that are sent abroad for recovery—in other words, to have something useful extracted from them. These wastes are by definition the raw material for another process, so stopping trade in them between parties and non-parties interrupts trade much more severely than preventing a few drums of something nasty being dumped across national borders. But if recovery wastes are regulated more lightly, the effect could be to open a loophole for drum-dumping.

The Basle convention poses special problems for the EC. In theory, the Community can sign the treaty only as a single unit; to do so, it needs first to operate as a single market for wastes. That implies that each country accepts the standards operating in every other member. But each country has its own list of substances it regards as hazardous, and most are reluctant to remove anything from the list. This can cause anomalies: Germany, for instance, treats molasses as hazardous, because unscrupulous companies were pouring the stuff down drains, and listing it gave the authorities some control.

Even with the Basle convention in place, governments still worry that hazardous waste can be sent by rich countries to poor ones which cannot treat it. African countries have signed a treaty of their own, the Bamako convention, agreeing not to import any hazardous waste. Some countries wonder whether to copy Austria, where law requires an exporter to "know" that exported wastes will be handled as they would be domestically. But how is such knowledge to be acquired? Countries determined to import hazardous waste that they cannot treat are unlikely to invite inspectors to visit their non-existent facilities.



Disputed dolphin

With CITES, the issue is rather different. GATT rules do not prevent governments from banning the domestic sale of a product and enforcing the ban at their borders, as long as the ban does not discriminate on grounds of origin. A selective ban is always possible if the exporting country has agreed—as most potential ivory-exporters have done in the case of the CITES ban on ivory trade. But if an exporter decides to sell, as some southern African states may do in the case of ivory, an import ban might fall foul of the GATT's rules.

The Montreal protocol contains a provision that may be the shape of treaties to come. It bans imports from non-signatories of CFCs and products containing them. More ominously, one clause commits signatories to "determine the feasibility of banning or restricting, from states not party to this protocol, the import of products produced with, but not containing, controlled substances." Consultations with GATT on the trade provisions in the Montreal protocol led to some amendments, although it is not clear how far GATT officials agreed and how far they merely acquiesced in the treaty's phrasing.

All three conventions break the GATT's rule that no country must treat one trading partner worse than another, by imposing more restrictive trade provisions on non-signatories than apply to signatories. Sometimes, the GATT secretariat points out, this may not be necessary to achieve the treaty's goals: for example, countries could have set national quotas on their consumption of CFCs from any source, rather than threatening to ban CFC imports from non-signatories. But a general problem remains. If international environmental treaties use trade measures as disincentives to free-riding, then those measures will inevitably be selective restrictions on imports. Moreover, such restrictions

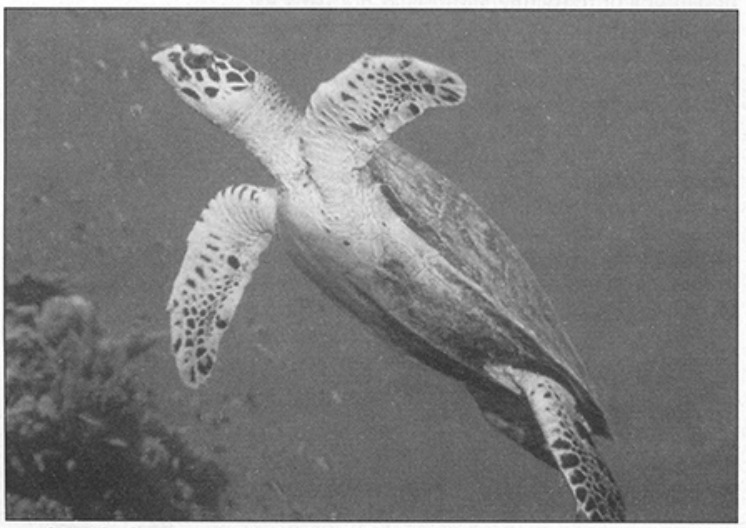
will generally apply to imports of goods produced by processes that the treaty aims to restrict. Both points will conflict with the GATT's rules.

Getting at the GATT

So far, no country has complained to the GATT about its treatment under an international environmental agreement. Clearly, the more countries sign up to an agreement, the less likely anybody is to grumble about the treatment of non-signatories. Environmental agreements are not intrinsically weaker (or stronger) than the GATT: both rely on the voluntary participation of countries which see the gains of co-operation as greater than the costs.

Environmentalists, who typically assume the GATT to be a free-standing international organisation like the World Bank rather than a stop-gap treaty, have begun to clamour for its reform. They want a clarification of the extent to which trade liberalisation should take precedence over environmental goals, and they want GATT's activities to be more open to popular scrutiny and even involvement by non-governmental organisations. GATT for its part this year included in its annual report a chapter on trade and the environment, and has revived a moribund committee to look at the implications for trade of a number of green issues.

A difficulty with this debate is that the main protagonists speak quite different languages. The culture clash between trade experts and environmentalists is striking. When meetings of government officials are held at the OECD, the international body that first began to examine the potential for a clash between the environment and trade, the old national alliances tend to disappear. Instead, trade-ministry officials hobnob at one end of the room, while the environmental bureaucrats talk shop at the other. The contrast between trade officials and non-governmental green groups is even more acute. Gary Stanley, a Washington-based environmental lawyer, contrasts the trade lobby, which is "comfortable with closed diplomatic negotiations and has well-articulated views and a desire to quantify issues and therefore a preference for tariffs over quotas", with the environmentalists who combine "distrust of governments with less well-articulated views and a dislike of quantifying." Both sides, he thinks, share one characteristic: they are idealistic and reluctant to compromise.



No friend of Japan's

Yet compromise is essential if the environment is not to become a fashionable excuse for greater protectionism. As yet, the effect of green issues on international trade is probably not large, and more discussed than actual. But if economic growth is slow and governments become increasingly protectionist, the environment is likely to be used as one excuse. And as international environmental agreements proliferate, they will inevitably include clauses on trade.

It may well be that the present stance of the GATT shows a lack of economic logic. David Pearce, a British environmental economist, argues that, from the point of view of the importing country, it should be irrelevant whether environmmental losses arise during production or consumption; both impose some costs on importing countries. This may be most obvious when the loss incurred during production is suffered directly by the importer, as when acid rain drifts across a border or when CFCs damage the ozone layer. But the importer may also suffer when an exporter chops down its rain forest or wipes out its rhinos.

However, as Mr Pearce admits, it would be formidably difficult in practice to allow exceptions for such "production externalities". The reason is clear from the ruling of the disputes panel in the tuna-dolphin case. Allow one country to discriminate against one production process on environmental grounds and the result is a whale-sized loophole. GATT rules set no bounds on such exemptions once they are allowed. Where would discrimination stop? Should exemptions be allowed only when the importing country is directly affected by the environmental policies of the exporter—as the waterways of Texas and California are polluted by fly-by-night Mexican companies across the border? Should they be allowed when the environmental harm occurs on no-man's land: in the deep oceans (as in the dolphin case) or in the atmosphere?

Which products should be banned? What happens if the country imposing the sanctions does not import the offending product? For instance, acid rain arises when electricity is generated, but electricity is rarely traded. Would everything whose manufacture involved the use of electricity in an offending country therefore be at risk? That question may sound ludicrous, but it already arises with the CFC tax imposed by the United States. The tax, levied on CFCs in America, applies to imports as well—including those that use CFCs in the manufacturing process. This is proving, as a recent OECD report pointed out, extremely effective in persuading South-East Asian makers of semiconductor chips to find alternatives to CFCs for cleaning their product. The market for semiconductor chips is highly price-sensitive and one where protectionism is tempting. Would the American tax pass a GATT panel? Probably not: when America's Environmental Protection Agency tried to design a tuna tax to replace the tuna embargo, it found it impossible to fulfil the GATT's rules.

The tuna-dolphin disputes panel argued that, if

the governments that belonged to GATT wanted to make it possible to discriminate against imports on the grounds of the environmental standards applied in their production, the contracting parties to GATT should draft a new rule, setting out the limits. GATT's members, pressed by the United States, may eventually take up that suggestion. Devising a proper boundary will not be easy.

Clearly the treaty should not condone the use of general trade sanctions by one government to bully another to adopt a particular environmental policy. It should certainly emphasise the freedom of countries to use labelling to draw consumers' attention to the way in which a product has been produced. But the GATT does need to allow, in carefully restricted circumstances, trade measures that are taken under international environmental agreements.

Indeed, it nearly did so. Ian Fletcher of Britain's Department of Trade and Industry points out that Article XX of the charter began life as article 45 of the Havana charter which was to have set up the International Trade Organisation as the third cornerstone of the reconstructed post war economy, alongside the World Bank and the IMF. That charter, stillborn when the United States refused to ratify it, contained an additional exception, covering measures "taken in pursuance of any intergovernmental agreement which relates solely to the conservation of fisheries resources, migratory birds or wild animals . . . " GATT now needs a clause of that sort.

Birds and bees

THE best way to protect wildlife is by international agreement rather than unilateral trade embargos. Wildlife protection was, indeed, the goal of some of the earliest environmental treaties.

The species that 19th-century diplomats negotiated about, though, were those with a commercial value: fish, seals, vicuna and (to name a 1902 European convention) "Birds Useful to Agriculture". Only in the past 30 years has there been a growth in conservation for its own sake, and in the protection of habitats, rather than of individual species. The intention at Rio is to sign a treaty to cap all wildlife treaties: a convention on "biodiversity". That is eco-jargon for biological diversity, covering everything from beetles to baboons. Small wonder it has proved so difficult to construct.

The early wildlife treaties tended to cover creatures that are found outside the jurisdiction of one country, such as whales, or that move from place to place, such as migratory birds. But increasingly, treaties are likely to reflect the fact that the ways countries with lots of animals and plants treat their natural heritage is of interest to people in other parts of the globe.

A recurrent theme in wildlife treaties (admirably analysed in a book* by Simon Lyster, who now works for the WorldWide Fund for Nature) is the tension between conservation and regulated exploitation. It is usually simpler to insist on a complete ban on the killing of a particular species than to regulate culling or hunting. But a complete ban may seem unreasonable if a commercially valuable stock of creatures recovers and is no longer in obvious danger of extinction. More important, some culling may often be essential to persuade countries that they will gain by co-operating in conservation.

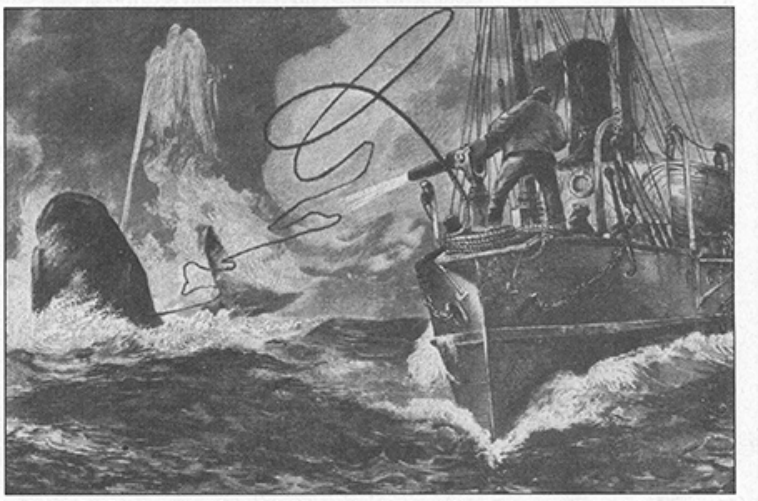
One interesting example of the way limited culling can bind countries into an agreement is the treaty to conserve the fur seal, whose numbers in the north Pacific became dangerously depleted in the late 19th century by "pelagic sealing"—killing at sea. Four countries hunted the seals: the United States and Russia (which between them owned all the islands on which the seals breed), and Japan and Canada (which caught the seals at sea, on their way to breed). Killing seals on land is much easier and less wasteful than killing them at sea, where most of those taken were females.

Governments are trying to use treaties to prevent extinction

Under a treaty of 1911, Japan and Britain (on behalf of Canada) agreed to stop pelagic sealing. In exchange, they were guaranteed a share of the seals killed by the other two countries at their island breeding-grounds. The arrangement was a success. Having fallen to about 300,000 in 1911, seal numbers recovered to over 2m by the 1950s.

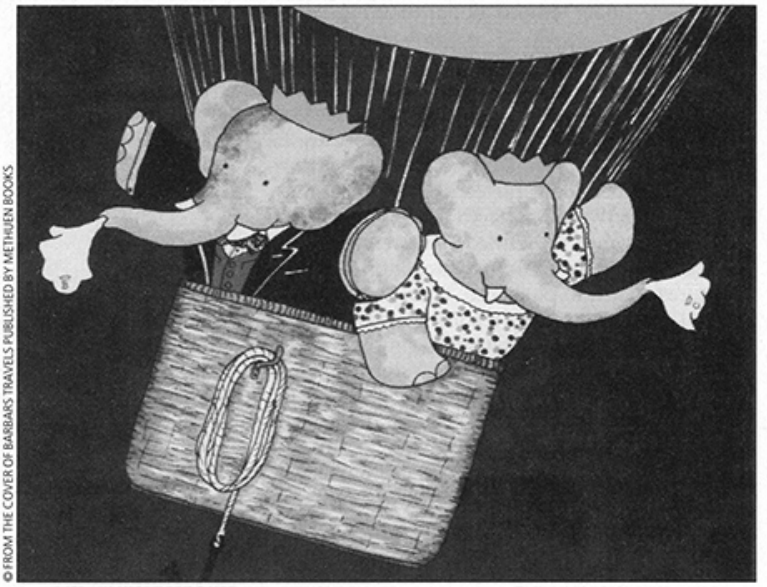
The 1911 treaty demonstrated the gains from co-operation: by banding together, the four countries secured the future of a valuable species that might otherwise have died out. It had a clear system of compensation, to win the participation of those countries that would otherwise have lost out. And it showed the case for bringing a natural resource under the management of one country (the owners of the islands) rather than treating it as open to all comers, and thus vulnerable to over-exploitation.

In the case of whales, fishing countries originally got together to protect stocks from over-exploitation. The whaling industry had a long history of boom and bust as the discovery of new



In need of a convention

* "International Wildlife Law". Grotius, 1985



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Bye bye, Barbar

whaling techniques and hunting grounds led to the exhaustion of one population after another. Because whales are caught in the deep oceans, an international treaty is the only way to affect their numbers. The early emphasis of the International Whaling Convention (IWC), signed in 1946, was on the orderly development of the whaling industry.

But the catastrophic decline of many species and the growth of increasingly vociferous lobbies against all whaling in a number of influential countries have shifted the balance. Commercial whaling was banned in 1986. In June the IWC meets in Glasgow to discuss the possibility of allowing limited commercial whaling to resume. Up to now, much of the argument has been over whether hunting will return some species to the verge of extinction. But as the stocks of some whales have recovered, anti-whalers increasingly argue that whales should not be hunted at all. This "animal- rights" lobby takes the simple view that it is wrong to kill a large, intelligent mammal for any purpose. The argument in Glasgow is thus likely to be between those who argue, on traditional economic and scientific grounds, that some killing should be permitted, and those who take a purely ethical approach. As ethics is easier to shout about than science, it will probably triumph.

Your species, our heritage

Because a country that wants to protect a species may not control it, it may try various ploys to persuade others to agree. New Zealand law prohibits its citizens from killing whales wherever they are—even if they are in the coastal waters of another state where killing is legal under local law.

More common is the use of trade bans, either unilaterally or as part of a treaty. International trade is often what gives an endangered species its commercial value. It may therefore seem logical to destroy that value. The danger is that, in destroying the value of the species, a ban will also destroy one of the most powerful arguments for protecting it.

For example, Austria and Holland have banned imports of tropical timber produced unsustainably. By depressing the price of timber, such a ban may discourage countries with rain forests from protecting their trees. If timber is valuable, the argument runs, countries will want to ensure that logging licences are properly priced and policed, in order to capture the profits available on world markets from selling a resource that cannot be produced in many other countries. If timber exports are prohibited, the land on which they stand may be cleared to grow something that can more easily be traded—such as beef.

Trade restrictions, as this survey has already argued, are central to CITES, the main treaty on endangered species. The provisions of CITES have become increasingly controversial not because of GATT's worries about the impact of environmental disputes on trade, but because of the debate over the future of the African elephant. The elephant's numbers collapsed between 1981 and 1989, falling from about 1.2m to just over 600,000.

To try to stem this massacre, a decision was taken in October 1989 to transfer the elephant from appendix II of CITES, which allows restricted trade in an endangered species and its products, to appendix I, which prohibits all international trade. But five southern African states have persistently demanded that their elephants be returned to appendix II. They argue that their own elephant populations are stable or rising, and that trade in elephant products is essential to help to pay for their conservation. When the members of CITES met in March this year, the five countries agreed not to reopen the ivory trade, but hoped for a compromise that would allow them to sell elephant hides and meat. They failed to win it.

Behind the argument over the elephant's future lies a difference of view on how to make elephants pay. For some countries, notably Kenya, elephants are a mainstay of the tourist trade. These countries have a particular interest in preventing ivory poaching. But protecting elephants is extremely expensive. Zimbabwe reckons that it costs $200 a square kilometre to protect elephants from illegal hunting for a year. Each beast needs about half a square kilometre of good grazing land. To provide an incentive to protect elephants in countries where tourists do not or cannot come to look at them, it may be essential to find other ways to make money from the beasts.

Can nature pay its way?

Timothy Swanson, of Cambridge University, argues that extinction is often the result not of a policy failure but of a deliberate decision. In a couple of papers for the Centre for Social and Economic Research on the Global Environment in London, he points out that most countries have converted their naturally diverse assets into those specialised plants and animals that grow quickly and are cheap to harvest. That conversion raises the productivity of the land. Between 1960 and 1980, Mr Swanson calculates, the amount of specialised agricultural land in the developing world increased by almost 40%. One marker is the advancing number of tractors: up 29% in Africa in the past decade, 82% in South America, 128% in Asia—and down 4% in North America. In the developed world, the pro-

cess of conversion has more or less ended.

If a country decides to retain a stretch of habitat in its natural form, that is an investment decision. If it turns a blind eye to logging or poaching, it is deciding not to invest in preservation. Open access to a natural resource is not a random mistake, but the result of an implicit decision to mine it and to convert it into something more productive. By seeming to care for their elephants, African countries preserve appearances rather than pachyderms.

If poor countries are to have an incentive to conserve their wildlife, it will have to earn them a higher return than alternative uses. That will be increasingly difficult: almost all the huge growth in the world's population (to between 10 billion and 23 billion before it stabilises, thinks the World Bank) will take place in poor countries. Although the growth will take place mainly in cities, the need to grow enough food will encourage the conversion of more and more land for agriculture. That may be restrained in some countries by raising the output from existing land. Ultimately, though, the increasing demand for farm land will need to be matched by an increasing return from conservation, if countries are to have an incentive to protect habitat.

How, then, ought countries that invest in biodiversity to be compensated for doing so? Mr Swanson suggests three ways. First, wildlife producer organisations need to be set up to extract the maximum value from the consumers of sustainably produced natural resources. At present, exported wildlife often brings only a tiny fraction of its worth in rich markets to those who capture or kill it. For instance, parrots from Irian Jaya, exported from Indonesia for $2 each, sell in the United States for $500 wholesale. Such organisations would need the backing of importing countries to ensure that a black market in unsustainably produced wildlife did not develop. The saga of tuna from the eastern tropical Pacific, described earlier in this survey, is testimony to the difficulty of that: Italy and Japan have cheerfully continued to import drift-netted fish, which America's ban has made cheaper.

Secondly, unmodified genetic material may turn out to be useful in unpredictable ways. One of the most quoted examples is the rosy periwinkle, a medicinal plant from Madagascar discovered in the early 1960s to be useful in the treatment of several kinds of cancer. Yet no way exists to reward developing countries for preserving their natural gene pool. Indeed, it is usually impossible to patent natural resources. That needs to change. Some botanical institutes, including those in New York and at Kew, in London, now make it a condition of plant research carried out on behalf of large companies that royalties for any commercially useful discoveries are paid to the countries from which the genetic material comes. Earlier this year Merck, Sharp and Dohme, a large pharmaceutical company, agreed to pay Costa Rica a flat "prospector's fee" of $1m, and royalties on any products developed from genetic materials discovered in the country.

Conservation spending

Country	Year	Total $m	% of government spending	% of GDP
United States	1988	1,702.3	0.16	0.04
Denmark	1989	45.0	0.11	0.04
Indonesia	1988	6.0	0.04	0.01
Malaysia	1988	5.0	0.05	0.01
Tanzania	1983	2.9	0.17	0.05
Botswana	1984	1.3	0.31	0.13
Sri Lanka	1988	0.6	0.03	0.01

Sources: UNEP; US Department of the Interior; World Bank; IMF; National statistics

Lastly, biological diversity offers the world a sort of insurance against the risks that over-bred plants or species will succumb more readily to pests and diseases. Wild strains are periodically bred back into domestic ones to strengthen and protect them. Mr Swanson suggests some sort of international fund to make payments to countries that protect certain natural species or habitats.

It would not be difficult to boost conservation spending in the developing countries. As the table shows, the proportion of government spending and national wealth devoted to conservation is surprisingly high in some poor countries, but the absolute sums are tiny compared with spending in the richer nations. Estimates for the World Bank's *World Development Report* suggest that $1 billion-2 billion of extra direct spending a year could be absorbed in conservation in developing countries, although the amount might increase substantially later on. That sum, though, is roughly what the United States spends annually on conservation.

To work, such spending needs to be sustained. It needs to be treated not as foreign aid or one-off benevolence, but as a perpetual commitment to import environmental services. The prospects are discouraging. The African Elephant Conservation Co-ordinating Group, based in Britain, has drawn up conservation plans for elephants in 33 African countries. Their total cost would be $480m over five years, of which $300m still has to be found. That is small by foreign-aid standards, but large compared with what voluntary bodies can muster. The World-Wide Fund for Nature, which is spending over $4m this year on elephant-related projects in Africa, argues that the failure of donors to turn agitation into money is regarded by African states with "bitterness, anger and scepticism". If the developed countries cannot muster the money to conserve the African elephant, what hope for other animals?

Everybody's atmosphere

THE governments that, in September 1987, signed the Montreal protocol, took themselves by surprise. This remarkable treaty bound signatories to reduce and eventually to stop their consumption of CFCs, which had been found to deplete the ozone layer. The relative ease with which the Montreal protocol was agreed, and the success with which it has so far been implemented, have helped to convince people that it will not be much harder to tackle global warming in the same way. This view is almost certainly wrong.

Only international agreement can preserve the ozone layer and stop global warming

The Montreal protocol has a number of provisions designed to make it work more effectively: developing countries are allowed an easier timetable for phasing out CFCs, and indeed have been permitted some increase in the early years of the

Easier than cooling the planet

protocol. In a pair of innovations, a special fund has been set up to help developing countries adopt replacements for CFCs if they cost more than what is being replaced; and clauses in the agreement urge parties to ensure that the transfer of the best available technology to replace CFCs takes place "under fair and most favourable conditions".

It was probably not those innovations, though, that eased the passage of the Montreal protocol. Three other factors mattered more. First, hard scientific evidence: the discovery in 1984-85 of the thinning of the ozone layer over Antarctica persuaded countries to sign the Vienna convention and start work on the protocol. The finding, announced in October 1991, that about 3% of the ozone layer had gone from over the United States and other temperate countries, raises the possibility of 12m more cases of skin cancer in the United States over the next half century, as well as losses of agricultural production. It adds to the pressure to phase out CFCs in developed countries.

Secondly, CFCs are produced by a small number of companies, most of which also produce at least one of the chemicals being used as substitutes for CFCs. In the United States, easily the main producer (and consumer) of CFCs, the companies that made the chemical saw that they might be sued by people who contracted skin cancer. The substitute chemicals were both more expensive and less widely applicable. A world ban on CFCs was obviously an ideal way to lock up the largest possible market for the substitutes. The main CFC manufacturers have therefore tended to support the protocol. The costs of change fall mainly on users, who are more scattered and have less political clout.

Lastly, the existence of substitutes has reduced the costs of change. Where substitutes can be "dropped in" without big changes in technology—as in aerosols—CFCs have been rapidly abandoned. Where no good substitute yet exists, as with air-conditioning in cars, it has been much slower.

The result is to underline a point made by Scott Barrett of the London Business School: the smaller the extra cost to a country of signing up to an international agreement and the greater the benefit, the more likely it is to do so. With climate change, the extra costs will be much larger.

Warming up

That the world's nations have already agreed on a treaty on climate change (to be signed in Rio de Janeiro next month) is extraordinary. It is, after all, less than a decade since global warming was first discussed outside laboratories and only 15 months since negotiations began. The new climate convention goes further than did the Vienna convention, the first agreement on CFCs. Yet in a number of ways, the issues raised by global warming will make it harder to turn agreement into action.

Although there are good grounds for believing that the accumulation of greenhouse gases in the atmosphere will warm the planet, there is much less certainty about the pattern which that warming will take, let alone its impact. Scientists are unsure about the extent to which warming will be offset or reinforced, or about the speed with which it will occur. They are unsure how far expanding oceans will raise sea levels, or whether and where droughts and rainfall will increase. It seems unlikely that all the effects of global warming will be harmful, but it is as yet impossible to predict which countries may gain, which lose, and how.

Not only is the damage inflicted by climate change difficult to predict; insofar as it can be discerned, it is of a kind that frightens the rich countries less than the prospect of a thinner ozone layer. Nobody has yet found a way of linking climate change to skin cancer (although some have tried to argue that hotter weather will bring malaria to New York). It is not easy to see how gradual climate change can have much observable impact on human health. It may impose economic costs, mainly in the form of lost farm output and the need to build sea walls around low-lying towns. But agriculture is a small part of output in the rich countries, and building sea walls is not ruinously expensive.

Two studies for the United States have had a stab at estimating the total costs of adapting to climate change induced by the equivalent of doubling carbon dioxide in the atmosphere. They produce a figure of about 1% of GDP. One of them, conducted for the OECD by William Cline, suggests that over the next 250 years, the costs might be about 6% of American GDP. The figure for developing countries would not necessarily be higher: such estimates depend largely on property values, which are lower in the third world than the first.

These figures do not allow for the possibility of nasty surprises such as, say, a shift in the pattern of ocean currents or a sudden rise in sea level caused by the melting of polar ice. The rash of new discoveries about the extent of ozone depletion is a reminder of the difficulty of predicting a wayward atmosphere. Nor do they include the incidental environmental benefits that might flow from reducing the output of carbon dioxide from burning fossil fuels. Rough estimates for Norway and Britain by David Pearce indicate that the "secondary benefits" of suppressing some of the other pollutants given off by burning fossil fuels might be much larger than the immediate gains from reducing car-

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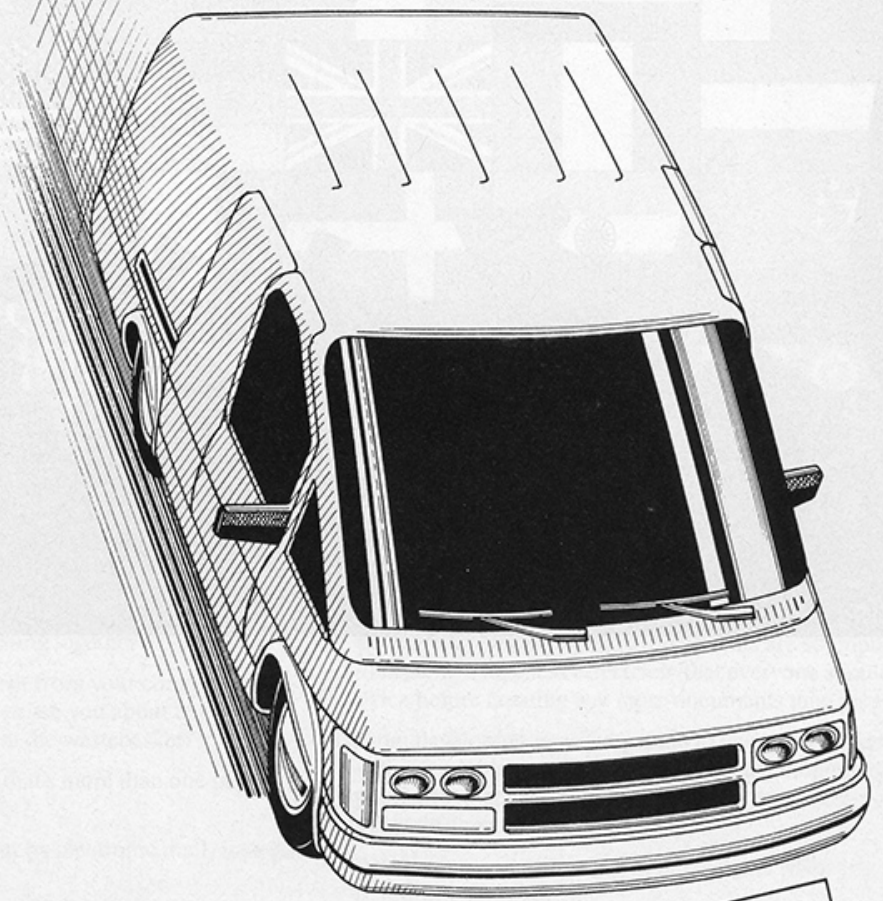

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bon-dioxide output. However, there are much less expensive ways to reduce these pollutants.

Over the next half century, the damage caused by global warming may be quite modest. Over the much longer term, it may be greater, although not (at least for rich countries) catastrophic. The world can react to this prospect in two ways: it can take action to slow down climate change, or it can wait until it happens and then adapt. The balance between these courses will depend on how the costs of action compare with the costs of wait-and-see.

Rather more economists have tried to quantify the costs of action than the benefits of avoided damage. Most estimates fall within a range of 1-3% of gross domestic product. Projections that run so far into the future must be treated cautiously. A tiny change in assumptions can have an enormous cumulative effect. But the most striking feature of the estimates is their similarity. This impression is backed up by work* at the OECD, which concludes that stabilising emissions of carbon dioxide in the OECD countries by the year 2000 at 1990 levels might entail an average loss of real income of 0.6% over the period 1995-2050 compared with no policy change.

Such costs are not wildly out of line with the benefits that might be expected if everybody else stabilised. But there's the rub. By the middle of the next century, calculates the OECD, stabilisation by its members at current levels would reduce world output of carbon dioxide by 11% from the level it would otherwise have reached. But unless the developing countries could be persuaded to follow, their output would swamp that achievement. On some estimates, the carbon-dioxide output of China alone would exceed that of the entire OECD.

Yet persuading the non-OECD countries to curb their carbon-dioxide output will be much harder than the task that has dominated the run-up to Rio: that of bringing the United States aboard. The OECD paper estimates that the average loss of real income to the non-OECD countries of stabilising their output of carbon dioxide would be almost 5% in 1995-2050.

In fact, developing countries also have plenty of scope for free lunches. Their electricity prices are, on average, barely one-third the costs of supply and roughly half those in developed countries; indeed, much third-world debt is the upshot of borrowing to build power stations and then subsidising their output. Petrol prices average about $1.25 a gallon (compared with $3-4 per American gallon in Europe and Japan). Few have more than rudimentary energy taxes. Given the rapid increase in local air pollution from power generation and traffic, many developing countries would be better off economically and environmentally if they priced fuel at rich-country levels.

Such free lunches are far and away the best hope for reducing the growth of carbon-dioxide output over the next half century. (Strikingly, last year was the first in industrial times when the world's carbon-dioxide output actually fell—thanks to the collapse of industry and rise in energy prices in Eastern Europe.) The OECD estimates that, if non-OECD countries removed all energy subsidies over the next decade, world emissions of carbon dioxide would be 20% lower in 2050 than would otherwise be the case. Moreover, as the table shows, removing distortions in energy taxes delivers cuts in emissions as well as faster economic growth. No other strategy offers these double benefits.

Sharing the carbon cuts

	% cut in CO_2 in 2050, compared with business-as-usual			% change in real income*		
	OECD	Non-OECD	World	OECD	Non-OECD	World
Stabilise OECD emissions in 2000	–43	0	–11	–0.6	–0.3	–0.4
Impose a mixed energy/carbon tax (EC only)	–10	0	–3	–0.2	–0.2	–0.2
Stabilise global emissions†	–54	–68	–64	–1.2	–3.2	–2.1
Eliminate distortions in energy prices	10	–31	–20	0.1	1.1	0.5

*Present value of real-income changes, computed using a 1.5% discount rate †Assumes OECD countries cut emissions in 2010 to 80% of their 1990 levels and stabilise them thereafter and those of non-OECDregions rise to 50% above their 1990 levels by 2010, and stabilise thereafter. Source: OECD

Another group of countries likely to be unenthusiastic about reducing carbon-dioxide output is the big energy producers. With CFCs, it was relatively easy to win the agreement of producer countries accounting for two-thirds of emissions. With carbon dioxide, it will be much harder. Two-thirds of the world's coal reserves (the most carbon-rich fuel) are split between the United States, China and the former Soviet Union; three-quarters of its oil reserves are in OPEC; three-quarters of its natural gas is split between OPEC and the old Soviet Union. All these countries stand to lose revenue if the climate-change treaty reduces world demand for fossil fuel.

Will it? A strong temptation for some countries will be to cheat. If developed countries reduce their use of fossil fuels, energy-intensive industries will flourish in countries which benefit from a lower world-market energy price. Just possibly, the overall effect might be to leave world output of carbon dioxide higher than it would have been without an agreement, because energy-intensive industries would flourish in some of the least energy-efficient countries. The danger of "carbon leakage" will be lower, the more countries abide by an agreement. The need to avoid the danger is one more reason for an agreement to work as efficiently as possible.

One kind of cost

* "The Cost of Reducing CO_2 Emissions: Evidence from GREEN". By Jean-Marc Burniaux, John Martin, Giuseppe Nicoletti and Joaquim Oliveira Martins. Economics Department Working Paper, forthcoming.

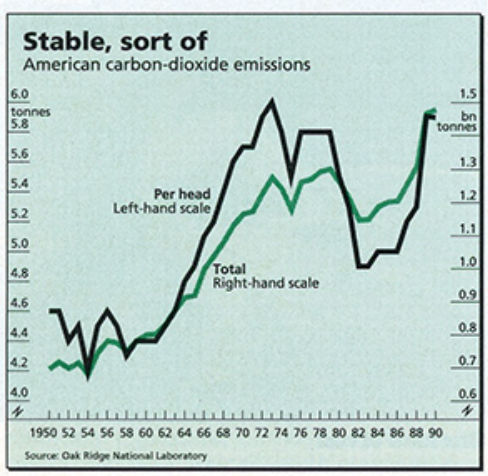
Towards agreement

But adapting may be more realistic

THE climate convention that will be signed at Rio is only a first step. To put flesh on its few bones, countries will need to take some difficult decisions over the next few years. In particular, the costs of implementing the agreement and the way those costs are shared will be greatly affected by the way the targets are defined and the mechanisms for allowing payments between countries. That in turn will determine how likely countries are to make commitments and then abide by them.

All the OECD countries except the United States and Turkey have had targets for their output of carbon dioxide for some time, although some have promised simply to help meet the EC's group target, without agreeing on their share. Not all have quite grasped what their chosen target implies. Some of the most senior civil servants in Britain's Department of the Environment have only recently realised that "stabilisation by 2005" does not imply business-as-usual in 2006. The Norwegians, one of the first countries to set a target, have been having second thoughts, declaring (quite rightly) that it is economically inefficient. The EC, having agreed an overall target, has failed to agree on how to share it out; much hope is pinned on the scope for energy efficiency in eastern Germany. The United States has infuriated its industrial partners by refusing to copy them; given that a target would be legally binding on the administration, in a way that is not true in other OECD countries, this caution is understandable. America's recent experience suggests that some modest target could be reached, if it were carefully chosen: as the chart shows, emissions per head are roughly where they were in the late 1970s.

As the Norwegians have realised, flat targets are indeed inefficient. They are the international equivalent of command-and-control measures in domestic environmental policy: they inflict the same reduction in emissions on high-cost and low-cost producers alike. That is likely to be vastly more expensive than concentrating reductions in those countries that can make them most cheaply. Rough calculations for the EC by Mr Barrett suggest that the most cost-effective distribution of reductions might be 50 times less expensive for the EC than achieving the same goal by stabilising emissions from each member country individually.



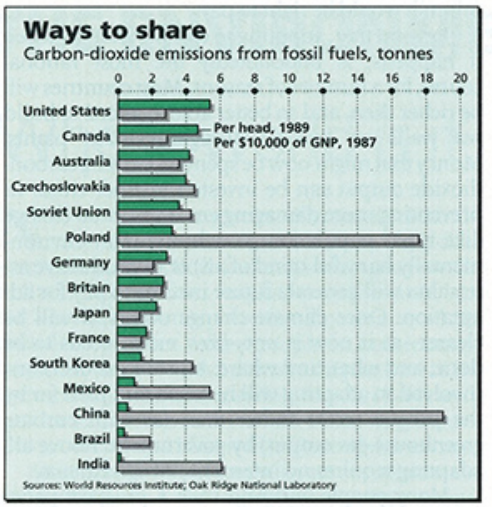
How else might targets be distributed? As the chart on the next page shows, national outputs of carbon dioxide differ, depending on whether they are expressed relative to population or to wealth. Plenty of elaborate schemes for sharing have been put forward. Each has different implications. Some involve targets in terms of the global-warming potential of all greenhouse gases rather than just carbon dioxide—logical, but fiendishly hard to measure or police. Some involve allowing for "sinks", such as tree-planting to lock up carbon dioxide, as well as carbon sources: logical, too, given that planting trees may be cheaper than some abatement measures. But how to ensure that the trees are replanted when they cease to grow?

Some people take as a ceiling a doubling of the concentration of carbon dioxide in the atmosphere from pre-industrial times. They then propose sharing out rights to that "stock" of atmosphere in various ways. Equity might urge that rights be allocated on the basis of population, on the grounds that every person should have an equal right to the carbon-dioxide absorbing capacity of the atmosphere. On that basis, the developed countries would already have exhausted all their rights and be into deficit. Pragmatism might suggest that rights be shared out on the basis of income. That would leave every group of countries with some scope for further emissions, but would give the lion's share to the rich.

Such exercises make it abundantly clear that no distribution of targets will be both fair and efficient (in the sense of ensuring that emissions are reduced where it is cheapest to do so). The more the initial allocation of targets is shaped by a desire for fairness, the more important it will be to have ways for countries to rearrange their obligations, by paying others to undertake them.

Such payments could be arranged in various ways. On paper the most elegant scheme would be to issue internationally tradable permits to emit a certain amount of carbon dioxide. Companies or countries that could reduce their carbon-dioxide output cheaply would have an incentive to do so, and then sell the permits they saved to other, less efficient countries. But the initial distribution of permits would be just as problematic as the initial distribution of targets; besides, no example of internationally traded pollution permits exists, and there are precious few examples of successful national schemes.

The sums that changed hands under a permit-trading scheme might be vast. Calculations for the *World Development Report* suggest that, if rights to emit were sold at $25 a ton of carbon, and if such rights were initially shared out on the basis of population, then the rich countries would have to pay the poor ones about $70 billion to afford one year's emissions at 1988 levels, a sum roughly equivalent to total official aid in 1989.



Equally improbable sums would change hands if, as others have suggested, governments levied a tax on carbon dioxide at a common rate and paid the proceeds into a pool, to be shared out as compensation to those countries that would otherwise be worse off. Another possibility would be a carbon tax which was set at a nationally agreed level but whose revenues stayed in the country that levied them. That is broadly what the EC has been considering, and it has the advantage of combining a uniform commitment with an economically efficient mechanism for reducing carbon dioxide. The disadvantage, though, as the EC is discovering, is that some countries will still find the costs of such action heavier than others—but no pool of revenue will be generated to pay them compensation.

Some system of payments is essential. As Mr Barrett argues in a paper for the OECD, unless the extra benefits of co-operating to reduce global warming can be shared out in proportion to the costs of action that each country takes, some countries will find that they are worse off, rather than better off, under the climate treaty. Those countries will have an incentive to refuse to sign, or to sign and cheat. The greater the costs of taking action (in other words, the less account an agreement takes of cost-effectiveness), the bigger will be their incentive to be free riders.

And such payments must not be seen as a gift. The gainers from the climate treaty will gain only if the losers also sign, and comply. The OECD, as the last article argued, achieves little if China is obstructive. Payments therefore need to be seen, like those payments for wildlife conservation, as imports of environmental services, or as a way of sharing out the world's gains from co-operating. They will, however, increase the costs of (or rather, reduce the gains from) co-operation for the countries that provide the money.

On the road to Rio, money has been the main north-south divide. A mechanism for side payments exists: the Global Enveironment Facility (GEF), set up in 1990 to pay for pilot projects that reduce climate change and conserve biodiversity. The Rio conference will agree to channel extra money—probably between $2 billion and $5 billion over three years—into the GEF.

The developing countries have been demanding that the GEF's structure be reformed, to give them more say over where the money goes. But the developed countries are anxious to avoid a repetition of the problems that have surrounded the interim fund created under the Montreal protocol. There, work programmes have been scrutinised in mind-numbing detail; some officials claim that more has been spent on travelling to and from meetings than on the individual programmes so far discussed. That would not be difficult: more than a year after the interim fund has been set up, a little money has been committed but none disbursed. The GEF, managed in the World Bank by a quarter the number of people running the Montreal protocol fund for the United Nations Environment Programme, has formally approved nine projects in the first year of its existence and disbursed $36m.

However carefully a compensation scheme is designed, and however much money passes across the exchanges, some governments will be tempted to cheat. For the countries that expect to gain most from preventing climate change, it will be tempting to dream up punishments. The range of options is depressingly narrow.

One, suggested by Mr Barrett, is the concept of a matching commitment. If one country drops out, all the others reduce the steps they are prepared to take; conversely, if an extra country joins, the ob-

They hold the key

ligations on signatories are stepped up. The theory is that the gains that the recalcitrant country might otherwise expect would be reduced as a result of its own actions. Such an arrangement would, for instance, allow the EC to promise that if the United States accepted a common target, the Community would increase the rate of carbon tax it imposed on itself and vice versa.

More probable is the use of some kind of trade sanctions. The Montreal protocol provides a precedent, but not a terribly useful one, in giving signatories the right to ban imports of CFCs from non-signatories. It is hard to imagine most countries banning imports of fossil fuels, let alone imports of products made with them. It is, however, all too easy to imagine governments imposing some kind of rough-and-ready "countervailing carbon tax" on free riders. The danger with such trade measures is that their cost, in terms of lost welfare, would be greater than the gains in welfare that a watertight climate treaty might bring.

Beyond price

The chances that the climate treaty will significantly change the world's output of fossil fuels over the next century is extremely slender. Does this matter? If the figures in the previous article for the costs of damage likely to be done by climate change are accurate, then the honest answer is "no". It would, of course, be wise for countries to take the free lunches available to them (if they are really free—in which case why have they not been taken already?) and to price their energy sensibly. It might be wise to go some way beyond that point, in the interests of buying insurance against nasty surprises—although it is impossible to know how large a premium it would be right to pay.

Beyond that, adapting to climate change, when it happens, is undoubtedly the most rational course, for a number of reasons. Most countries will be richer then, and so better able to afford to build sea walls or develop drought-resistant plants. Money that might now be spent on curbing carbon-dioxide output can be invested instead, either in preventing more damaging environmental change (like rapid population growth, the most environmentally harmful trend of all) or in productive assets that will generate future income to pay for adaptation. Once climate change occurs, it will be clearer—as it now is not—how much needs to be done, and what, and where. Most of the decisions involved in adapting will be taken and paid for by the private sector rather than (as with curbing greenhouse-gas output) by government. Above all, adapting requires no international agreements.

Many people will find such a prospect palatable. Here at last, it seems, is nature's revenge on humanity for economic growth. The sheer intricacy of the problems involved in climate change give the issue a special appeal. In the past three years it has attracted more research, from more different disciplines, than any previous environmental issue.

In fact, plenty of other kinds of environmental damage deserve greater priority. Water pollution kills more people than global warming is likely to do; soil erosion leaves more people hungry; the loss of species is just as irreversible; deforestation has locally (and perhaps internationally) dramatic effects on climate. The world has only so much wealth to devote to solving environmental problems. Any one of these deserves greater priority than global warming.

More damaging than global warming

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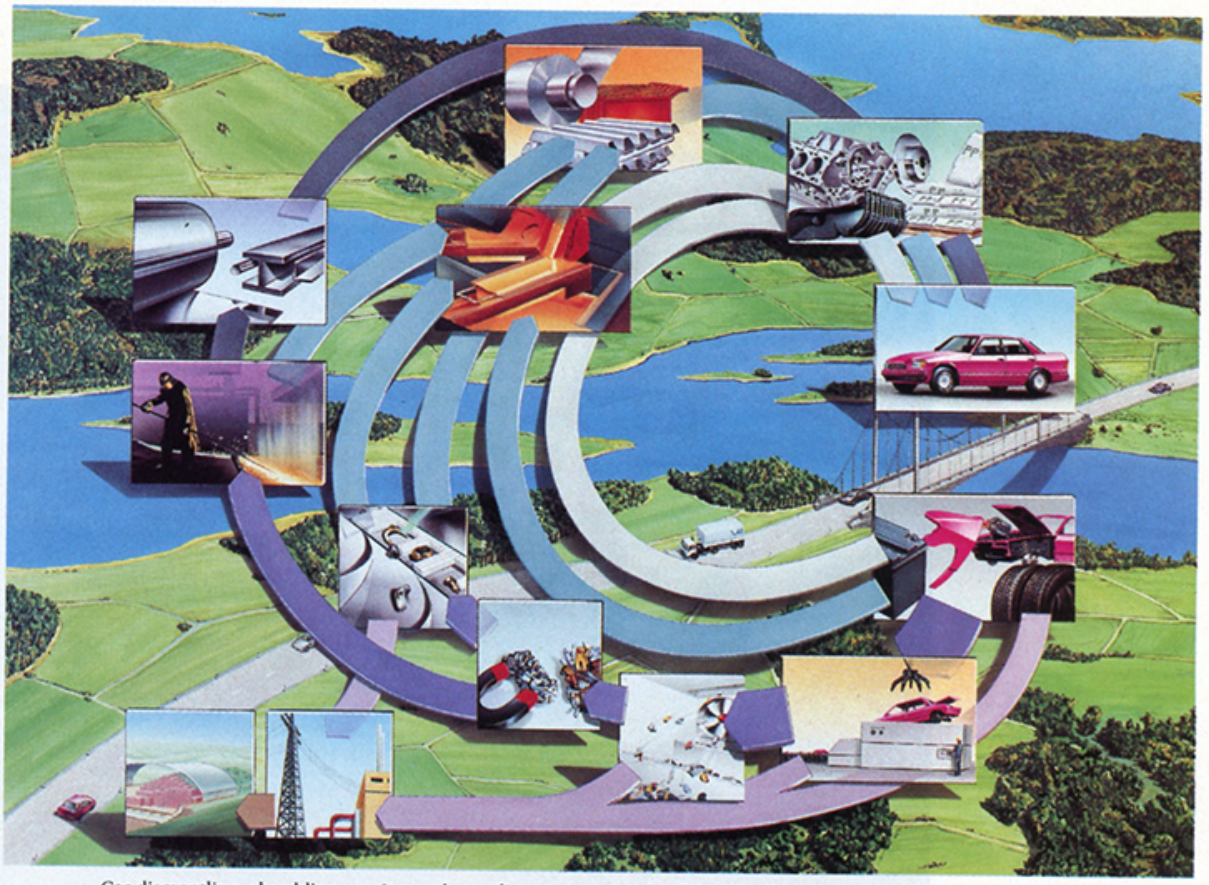

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